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# Food & Nutrition Research News Briefs

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## Nutrition and Health

The element boron, not now considered an essential nutrient, may be a key to preventing osteoporosis. Findings of a 6-month study of 12 postmenopausal women corroborate 6 years of animal studies indicating that boron is important in regulating the nutrients and hormones involved in bone building. After the women switched from a very low boron intake (0.25 milligram per day) to an ample intake (3 mg per day), they lost 40% less calcium, one-third less magnesium, and slightly less phosphorus in their urine. More significantly, their blood levels of estrogen doubled, matching that of women on estrogen replacement therapy--currently the only effective treatment for osteoporosis. Levels of testosterone, which the body converts to estrogen, more than doubled. Three milligrams of boron can be gotten through eating lots of fruits--especially apples, pears, and grapes--leafy vegetables, nuts, and legumes. The average daily intake is estimated to be about 1.5 mg. Followup studies are in progress. Grand Forks Human Nutrition Research Center, Grand Forks, ND  
Forrest H. Nielsen, (701) 795-8456

A spoonful of sugar helps the medicine go down; it also helps the calcium get absorbed. Ten grams--about a teaspoonful--of glucose sugar taken with calcium can increase the body's uptake of this essential mineral by nearly 25%. At only 40 calories, that's one-quarter the amount of glucose previously reported to enhance calcium absorption. Glucose polymers, sold in drug stores under several brand names as calorie supplements, are as effective as glucose sugar. Both appear to work in postmenopausal women as well as in young women. Calcium is not absorbed very efficiently, partic-

ularly in older people. This research is looking for ways to maximize a person's own ability to absorb it.

Human Nutrition Research Center on Aging at Tufts, Boston, MA  
Richard J. Wood, (617) 556-3185

Many people today may be suffering from a mild copper deficiency (less than 1 milligram per day) because they do not eat enough of the foods high in copper. Over the long run, that could be bad news for their hearts. In lab animals, copper deficiency has caused most of the risk factors for heart disease. Recent studies with eight men and eight women indicate that the earliest signs of copper deficiency occur after 3 or 4 months on a copper intake of 0.8 mg or less. Some people in the United States and other industrialized countries get only 0.8 mg through their diets but can remedy that by eating more copper-rich foods such as liver, oysters, chickpeas, nuts, and seeds. One study also showed that two copper-containing proteins are sensitive indicators of the onset of deficiency. The enzymatic activity of ceruloplasmin--found in the blood--and cytochrome-c-oxidase--found in all body cells--dropped even though standard indicators of body copper remained unchanged. Grand Forks Human Nutrition Research Center, Grand Forks, ND  
David B. Milne, (701) 795-8424

A mild copper deficiency has been shown for the first time to raise blood pressure, but only when the body is stressed. During a hand-grip test, eight healthy young women who got only 0.6 to 0.7 milligram of copper daily for 3 months had greater than normal increases in both systolic and diastolic pressures, with substantial increases in diastolic pressure. Isometric exercises normally result in smaller blood-pressure

lose its color when placed on the tongue, gave results that were unrelated to the volunteers' known vitamin C intake. ARS researchers are working on a replacement test that would be a simple, fast, and reliable check of vitamin C levels--and would not require taking blood or using any similarly invasive method.

Biochemistry Research, Western Human Nutrition Research Center,  
San Francisco, CA  
Robert A. Jacob, (415) 556-3531

There's hope for mothers of very premature infants who can't seem to produce enough milk for their newborns--as long as the mothers don't smoke. Women who delivered 8 to 12 weeks before term were instructed to empty both breasts using an electric pump at least 5 times a day for a total of more than 100 minutes. Twenty-three (80%) of 30 non-smoking mothers maintained an adequate supply of milk during the first month. But only 3 (27%) of 11 smoking mothers continued to produce enough milk. They averaged 18% less milk than the non-smoking women the first 2 weeks after giving birth, and 40% less by the fourth week. Although mother's milk must be fortified with extra protein and minerals for low-birthweight infants, it is preferred over formula or donor milk because it enhances the infant's immunity to infections.

Children's Nutrition Research Center,  
Houston, TX  
Judith M. Hopkinson, (713) 799-4834

### **Tomorrow's Foods**

Future dairy and meat products may have their genesis in a vial of sexed sperm. The science of sex preselection--choosing male or female offspring in advance--is closer than ever. Unique technology, developed by ARS, gives 90% to 95% accurate predictions of whether bull, boar, or ram sperm cells would produce a male or a female upon fertilizing an egg. A laser-driven instrument sorts X chromosome-bearing (female) sperm from Y chromosome-bearing (male) sperm, based on differences in amounts of DNA in each. Dairy farmers could cut expenses by

producing more heifer calves than bull calves. Beef and sheep farmers would benefit with more males, and swine farmers with more females for faster meat production. The experiments were conducted with sperm treated to remove tails and outer coverings. Although the treated and sex-sorted sperm remains viable when injected into mammalian eggs, scientists have now moved on to preliminary testing with intact sperm which would be suitable for artificial insemination.

Reproduction Lab, Beltsville, MD  
Lawrence A. Johnson, (301) 344-2809

Tomorrow's peaches could come from trees that begin life in a lab dish. Peach trees from small shoots raised by tissue-culture techniques bore 10 times more fruit in their second year than conventionally grafted trees. Normally, peach trees need 3 years to begin producing a cash crop. But 2-year-old tissue-cultured trees produced a crop of 285 peaches per tree, compared to 33 peaches on trees from standard stock. Eventually, the two types of trees will produce similar yields, but a marketable second-year crop would benefit the orchard grower's pocketbook.

Tissue Culture and Molecular Genetics Lab, Beltsville, MD  
Freddi Hammerschlag, (301) 344-4072

Autumn Gold, an attractive new iceberg lettuce with well-rounded heads may be on the grocery shelves within a year. The lettuce is designed for December and January harvest in California and Arizona desert regions, where much of the nation's winter lettuce crop is produced. From the grower's standpoint, the new variety has two important features. It resists mosaic virus that makes plants worthless: infected plants form small, distorted heads, with leaves that have an unhealthy "mosaic" pattern of dark and light green. And it doesn't go to seed too early--a common, hot-weather problem with some other varieties planted for late fall or early winter harvest from desert farmlands.

Vegetable Production, U.S. Agricultural Research Station, Salinas, CA  
Edward J. Ryder, (408) 443-2253

increases than those measured in the study. The women had no change in blood pressure while at rest or moving about, and the low copper intake did not affect heart rate. The recommended daily intake for copper is currently 2 to 3 mg, but most Americans get only about half that amount.

Grand Forks Human Nutrition Research Center, Grand Forks, ND  
Henry C. Lukaski, (701) 795-8429

A tissue culture cell line derived by an ARS scientist from the fall armyworm, a pest of corn and wheat, is playing a part in the development of a potential AIDS vaccine. Researchers at MicroGeneSys, a biotechnology company based in West Haven, Connecticut, selected a refinement of the armyworm cell line as the factory for a basic component of the vaccine. They did this primarily because insect cells have membranes similar to those of mammalian cells but cannot pick up mammalian viruses that might contaminate the vaccine. Food and Drug Administration officials recently approved the AIDS vaccine for clinical testing.  
Insect Pathology Lab, Beltsville, MD  
James L. Vaughn, (301) 344-3689

Evidence that vitamin C may increase blood levels of the so-called "good" cholesterol has been corroborated in a survey of 238 elderly Chinese Americans, whose eating habits differ from the typical American diet. Scientists found the same correlation between blood levels of vitamin C and HDL-cholesterol that was noted in an earlier survey of nearly 700, mostly Caucasian, men and women over 60. The higher the vitamin C, the higher the "good" cholesterol. But the correlation was not found in smokers. They also had lower vitamin C blood levels. Because surveys are merely "snapshot" observations of populations, these findings are only circumstantial evidence. The scientists are now administering large daily doses of vitamin C (about 17 times RDA) to volunteer subjects to see if it, in fact, elevates HDL-cholesterol over the long term.

Human Nutrition Research Center on Aging at Tufts, Boston, MA  
Gerald Dallal/Paul Jacques,  
(617) 556-3347/3322

Getting older doesn't have to mean getting weaker. In a 12-week strength training program, 12 healthy, untrained men ranging in age from 60 to 72 years disproved the notion that age itself causes a decline in muscle function. After training both legs on a thigh-knee machine, muscle size increased 15% and strength of the quadriceps increased 170%. There was also a significant increase in the turnover of actomyosin (a protein that allows the muscles to contract). Increased muscle strength could have a marked effect on the capacity of the elderly to lead independent lives. Human Nutrition Research Center on Aging at Tufts, Boston, MA  
William J. Evans, (617) 556-3076

A chemical gum that repels ticks has been found in a sweet-smelling African shrub (Commiphora erythraea). The shrub, a relative of the myrrh plant, produces a gum that shows promise as a repellent to the three most prevalent U.S. ticks--American dog tick, lone star tick, and deer tick. The gum is actually toxic to the dog and lone star ticks. ARS tests, conducted in cooperation with a visiting chemist from Tanzania, indicate that the purified active ingredient in the gum could be developed into an environmentally safe tick control. The dog tick is the primary transmitter of Rocky Mountain spotted fever, and the deer tick transmits Lyme disease to humans. The lone star tick is a pest of livestock and humans in southern states.  
Livestock Insects Lab, Beltsville, MD  
J.F. Carroll, (301) 344-4171  
Insect Chemical Ecology Lab,  
Beltsville, MD  
J.D. Warthen/A. Maradufu, (301) 344-2139

A test for vitamin C that dentists sometimes use to check their patients' levels isn't reliable, according to results of a 3-1/2-month experiment by researchers from ARS and the University of California at San Francisco. Because vitamin C (ascorbic acid) is needed for healthy gums, patients with gum disease are often checked for vitamin C deficiency. The older test, the "lingual ascorbic acid test," which measures how long it takes for a drop of blue dye to

## Food Freshness and Safety

Salmonella bacteria in poultry could be reduced by eliminating the organisms in the feed-manufacturing process. Current pellet-manufacturing machines use one-stage steam conditioners to add moisture and heat to the feed mixture to help form pellets. An experimental two-stage conditioner, built by ARS scientists, doubles the time of heat treatment without reducing the feed flow rate. In pilot trials, feed inoculated with Salmonellae was processed through the new conditioner. Results: while some of the organisms survived the first stage, all were eliminated at the end of the second stage. Three-fourths of U.S. poultry feed is pelleted.

Poultry Meat Quality and Safety, Richard B. Russell Research Center, Athens, GA  
Albert D. Shackelford, (404) 546-3531

Strawberries are sweet on the vine and the tongue, but so far only 1 variety of 10 tested survives well in the produce department. Strawberries are not usually bred for shelf life but rather for their size, yield, and taste. Of the 10 varieties tested under simulated retail conditions, 9 had more than 75% decay from fungal growth after 3 days. But Cardinal strawberries had less than 10% decay. Preliminary investigations have begun to find out exactly what makes Cardinal more resistant to fungal decay. As a first step, a check is being made for correlation between the makeup of the cell wall (sugars and carbohydrates) and susceptibility to decay in the strawberry. For taste, Cardinal was rated a 4 out of 10, with 1 being the best.

South Central Agricultural Research Lab,  
Lane, OK

Benny D. Bruton, (405) 889-7395  
Horticultural Crops Quality Lab,  
Beltsville, MD

William S. Conway/Kenneth C. Gross,  
(301) 344-3128

A milk protein, casein, may help slow the growth of bacteria that can cause food poisoning and spoilage in food products. Computer predictions based on lab studies indicate that a mixture of the protein and calcium salt at 36°F will retard the growth of some types of food-poisoning bacteria, such as those that cause salmonellosis and the often-fatal botulism. The protein and salt appear to use up water that these microbes need to grow. Food processors may be able to use this information to develop new products that last longer in storage and have minimal artificial preservatives. Macromolecular and Cell Structure Research, Eastern Regional Research Center, Philadelphia, PA  
Thomas F. Kumosinski, (215) 233-6475

New ways to control insects may develop from a chemical found in a wasp that is a parasite of caterpillars. When injected into many types of insects, the chemical stops them from molting so they can't mature. Extracted from the female Euplectrus plathypenae wasp, the chemical stopped growth in all butterflies and moths tested, including the bollworm, armyworm, and cabbage looper, and some beetles--asparagus beetle and common green lacewing. The next step: isolate and identify the chemical to determine its most effective uses.

Biological Control of Insects Research  
Lab, Columbia, MO  
Thomas A. Coudron/Ben Puttler,  
(314) 875-5361

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The Briefs is published quarterly in January, April, July, and October. For further information or addition to the mailing list, contact Judy McBride, ARS Nutrition Editor, at (301) 344-4095; or write to me at ARS Information, Bldg. 005, BARC-West, Beltsville, MD 20705.